Fish and habitat response to removal of the Rockford Dam on the Shell Rock River, Iowa

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Introduction

- Low-head dams impact habitat and sediment transport, and interfere with seasonal fish movements in many Iowa rivers.
- The Rockford Dam was constructed in 1871 on the Shell Rock River, a 4th order stream located in north central Iowa. This 170ft long x 8ft high dam was in a state of disrepair.
- To eliminate public safety hazard and liability issues, the Rockford Dam was removed in February 2014 at a cost of $245,989 (Figure 1).
- Expected fisheries benefits of this removal are improved habitat quality in the former impoundment and improved access to 11 river miles upstream of the dam.

Objective

- Quantify changes in physical habitat and fish assemblage structure after removal of the Rockford Dam on the Shell Rock River, Iowa.

Methods

- Habitat and fish community sampling was conducted at two sites upstream and one site downstream of the Rockford Dam, and at one control site on the Winnebago River (Figure 2).
- A pulsed DC boat mounted electrofisher was used to sample fish during summer 2013 and 2014. Due to extreme low water in summer 2012, a tow-barge electrofisher was used.
- Depth, velocity, and substrate composition was measured at seven points along 20 equally spaced transects at the upstream site, 37 transects at the impoundment site, 31 transects at the downstream site and 20 transects at the control site. Wetted stream width was measured at each transect.
- Habitat surveys were conducted at all sites in 2012 and 2013 but only completed at the impoundment and downstream sites after dam removal in 2014.
- All fish and habitat surveys were conducted during summer low-flow conditions.

Figure 1. Shell Rock River at Rockford before and after removal of the dam.

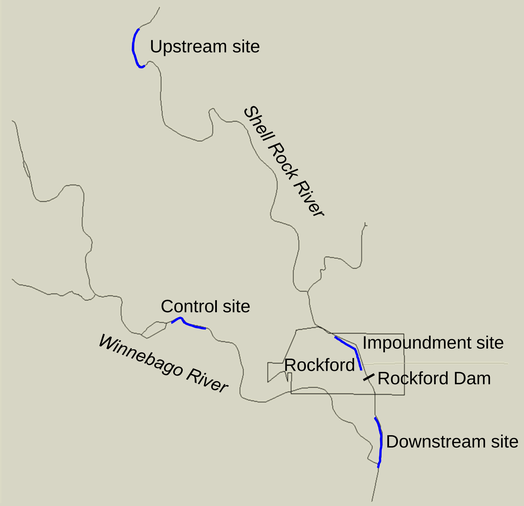

Figure 2. Habitat and fish survey sites on the Shell Rock and Winnebago rivers.

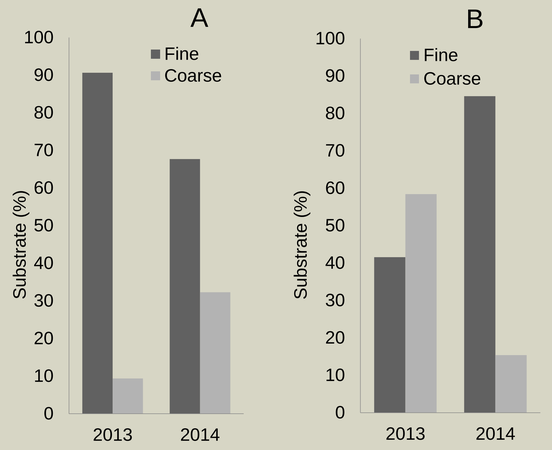

Figure 3. Percent fine (silt/sand) and coarse (gravel/cobble/boulder) substrate at the impoundment (A) and downstream (B) sites before and after dam removal.

Table 1. Mean and standard deviation (SD) of habitat variables sampled in the impoundment and downstream sites on the Shell Rock River before and after dam removal. Velocity was measured at 60% of water depth.

Sampling Site	Year	Wetted Width (m)	Depth (m)	Velocity (m/s)	Width/Depth ratio
Impoundment	2013	58 (15)	1.10 (0.53)	0.06 (0.05)	72 (59)
	2014	36 (60)	0.55 (0.26)	0.31 (0.17)	74 (35)
Downstream	2013	39 (11)	0.40 (0.32)	0.24 (0.19)	114 (266)
	2014	38 (10)	0.33 (0.22)	0.43 (0.19)	149 (126)

Table 2. Number of species, Channel Catfish, Smallmouth Bass, Golden Redhorse and Northern Hog Sucker sampled at 3 sites on the Shell Rock and 1 site on the Winnebago rivers during 2012-2014.

River	Sampling Site	Year	Number of species	Channel Catfish	Smallmouth Bass	Golden Redhorse	Northern Hog Sucker
Shell Rock	Upstream	2012*	25	3	11	0	0
		2013	27	0	59	0	0
		2014	27	7	32	22	1
	Impoundment	2012*	26	17**	0	0	0
		2013	10	0	3	0	0
		2014	27	11	13	14	4
	Downstream	2012*	38	68	54	126	10
		2013	28	32	67	107	14
		2014	19	23	1	22	8
Winnebago	Control	2012*	32	23	145	14	75
		2013	24	30	42	48	19
		2014	28	9	28	38	9

***** Sampling conducted with a tow-barge electro-fisher. ** Young of year Channel Catfish

Results

***Habitat -** After dam removal*

- Mean wetted width decreased at the impoundment site and did not change at the downstream site (Table 1).
- Water depth decreased at both sites.
- Water velocity increased at both sites but was more variable at the impoundment site.
- Fine substrate decreased at the impoundment site (Figure 3A) and increased at the downstream site (Figure 3B).
- Mean width/depth ratio stayed about the same at the impoundment site but increased at the downstream site.

***Fish -** After dam removal*

- Number of species sampled increased at the impoundment site and decreased at the downstream site (Table 2).
- Golden Redhorse and Northern Hog Sucker were collected at both sites above the dam where they had not been sampled previously (Figure 4).
- Number of adult Channel Catfish and Smallmouth Bass increased at the impoundment site but decreased at the downstream site.

Figure 4. Golden Redhorse and Northern Hog Sucker collected at river reaches upstream of Rockford, IA.

Discussion

- In the first year after dam removal, the impoundment site became more riverine with habitat suitable for a larger number of river species. Fish are now able to move into upstream reaches that were previously inaccessible and fish community composition improved at the impoundment site.
- Fine sediment from the impoundment was deposited at the downstream site reducing habitat quality for species which prefer deep pools and/or coarse substrates. As a result, fish community composition declined at the downstream site.
- Continued monitoring at this site will help determine the long term effects of dam removal on the habitat and fish community in the Shell Rock River and help guide future restoration projects.

Acknowledgements

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